Math 3C Midterm 1 Study Guide

October 23, 2014

Acknowledgement I want to say thanks to Mark Kempton for letting me update this study guide for my class.

General Information: The test will be held Thursday, October 30 during class at 7:00pm in 214 Center Hall. The test will cover the sections covered in class from 1.3 through 4.2. There will be about 6 free response questions. To receive full credit, show all your work or explain your reasoning. Even if you get an answer wrong, you can still get a significant amount of partial credit if you have good reasoning or a correct setup. You are required to bring a Blue Book, which is where you will work out your answers. You are allowed to bring with you 1 sheet of handwritten notes. No calculators or electronic devices will be permitted.

The following is a summary of each section and the relevant material. It is not intended to be an exhaustive list of everything that could possibly be on the test, but is a guide to help you focus your study on the most relevant material.

1.3

Be familiar with:

- The real line and inequalities.

- Interval notation, including the union symbol when multiple intervals are involved.

- Solving equations and inequalities involving absolute values.

Suggested practice problems: 5-8, 35-43.

2.1

Be familiar with:

- The coordinate plane and coordinates.

- Basic notions of graphing.

- The distance formula.

- Equations for circles and the circumference of a circle.

Don't worry about: Drawing graphs of complicated or unfamiliar equations. If I make you draw a graph, it will be something you know how to do, like a line, a parabola, or a circle or something similar.

Suggested practice problems: 9-20, 23-32.

2.2

Be familiar with:

- The concept of slope and how to compute it.

- Equations of a line, including point-slope form of a line and slope-intercept form for a line.

- Slopes of parallel and perpendicular lines.

- The midpoint formula.

Suggested practice problems: 3-6, 11-16, 25-36, 39-48.

2.3

Be familiar with:

- The quadratic formula.

- Finding the zeros of a quadratic.

- Completing the square.

- Graphing a parabola (finding the vertex and knowing if it opens up or down).

- Finding the minimum or maximum of a quadratic.

Don't worry about: Ellipses or hyperbolas.

Suggested practice problems: 13-16, 29-32, 39-48, 55-58.

3.1

Be familiar with:

- What a function is, function notation $(f(x))$, and evaluating a function (e.g. $f(9), f(3t + 2)$, etc.).

- Functions defined by graphs and tables.

- The vertical line test.

- Domain and range, including determining the domain from a graph, table, or formula (e.g. can't have 0 in the denominator, can't have a negative inside a square root, etc.).

Suggested practice problems: 1-12, 21-22, 59-64.

3.2

Be familiar with:

- All the function transformations, vertical and horizontal, and how doing something to a formula affects the graph.

- How these transformations affect the domain and range (remember, vertical transformations affect the range, horizontal transformations affect the domain).

- Applying multiple transformations in succession (especially doing them in the right order).

- Writing a formula corresponding to a transformation.

- The definitions of even and odd functions and the corresponding symmetries in the graph.

Don't worry about: Overly complicated or unfamiliar drawings. Again, if I ask you to draw something, it will be something you are familiar with, or something given to you.

Suggested practice problems: 1-14, 15-50, 55-58.

3.3

Be familiar with:

- Algebra of functions.

- Function composition ($(f \circ g)(x) = f(g(x))$).

- The importance of doing composition in the correct order.

- The definition of the identity function.

- Associativity of composition.

- Breaking down a complicated function as a composition of some simpler functions.

Suggested practice problems: 11-17, 25-30, 33-40.

3.4

Be familiar with:

- The concepts of inverse and one-to-one.

- Computing f^{-1} of specific values (e.g. $f^{-1}(5)$).

- Finding a formula for the inverse of a function.

- Composition of a function and its inverse ($f \circ f^{-1} = I$, this is a good way to check your work for the formula for an inverse).

- The relationship between the domain and range of a function and its inverse.

- Be sure not to confuse the notation $f^{-1}(x)$ with $(f(x))^{-1}$.

Suggested practice problems: 1-8, 9-10, 15-20, 29-36.

3.5
Be familiar with:

- Graphing an inverse function (reflection over the line $y = x$).

- The horizontal line test.

- Notions of increasing and decreasing.

Suggested practice problems: 1-12.

4.1
Be familiar with:

- All the rules of exponents (applying these should be as natural as breathing for you).

- The basic shapes of graphs of $f(x) = x^m$ and $f(x) = \frac{1}{x^m}$.

Suggested practice problems: 7-22, 25-32, 37-44.

4.2
Be familiar with:

- Definitions of polynomial and degree.

- Definition of a zero of a polynomial (including checking if a number is a zero of a polynomial).

- Factoring

- The relationship between zeros and factors of a polynomial.

- Finding a polynomial with given zeros.

Suggested practice problems: 1-10, 19-22, 23-24, 25-26, 27-28.

General Tips:

- Try to avoid the common algebra errors that really annoy math teachers (remember $(a + b)^2 \neq a^2 + b^2$, remember to distribute $-$ signs, etc.).

- Try to check your work as much as possible, and think about if your answer is reasonable. Often you can plug your answer back in to the question to see if it satisfies what it is supposed to.

- Don't necessarily expect your answers to all come out as nice numbers. If you get something like $\frac{2+\sqrt{5}}{3}$, just leave it like that.

- In general, it is good practice to simplify answers as much as possible, but if you are feeling pressed for time, just leave an answer unsimplified, and come back and simplify it later if there is time.

- Be calm and confident. If you have mastered the homework, then you know what you are doing.